Amendment of specification. Please replace the amended contents bellow.

A Method and Apparatus of Providing External Storage of Wireless Devices

Cross-References To Related Application(s)

[0001] This application is the continuation-in-part of United States Patent Application Se. No.10/713,904 in the name of the same inventor and entitled "Concurrent Web Based Multi-Task Support for Control Management System" and is also a continuation-in-part of United States Patent Application Se. No.10/713,905 entitled "Method and Apparatus for web-based Storage On Demand" and Application Se. No. 10/116,511 entitled "Intelligent Distributed Virtual Server" in the name of the same inventor.

Field of Invention

[0002] This invention relates to provide wireless user having a web-based working environment to use larger number of external storage.

Brief Description of the Invention

[0003] Today wireless users commonly face the problem of lack of storage capacity on their wireless devices such as cell phone or PDA, which usually limited to 256MB for PDA and much less for cell phone. To effectively solve this problem and let users own multiple GB of storage for their wireless devices as well as allow users to use gig-bytes storage for multimedia application, the storage on a server can be used as the external storage for wireless devices.

[0004] In one example that let each server unit (3 of Fig. 2) partitions its storage system in such way that each volumes will have multi-gig-bytes in size. Therefore, each user from web-browser of any of wireless devices can exclusively be assigned for accessing a specific storage volume on a server unit. In one embodiment, for example, if to provide each user 4GB of storage space, then a 160GB disk drive can support 40 users. A 4096GB storage system on a server unit can support 1024 user.

[0005] Further, any data on the wireless device can be transmitted to assigned storage volumes on a server unit. In addition, in one embodiment, the user on the wireless device can download the multimedia data from any ISP or ASP to the assigned storage volumes of a designated server unit through an out-band approach (Fig. 3). Finally, the user can use their web-browser to invoke embedded video or music, to enjoy their stored multimedia contents.

[0006] These and other futures, aspects and advantages of the present invention will become understood with reference to the following description, appended claims, and accompanying figures where:

Brief Description of The Drawing

[0007] Fig. 1 has illustrated a wireless device (1) configured with a web-browser (8) and can access a server system (3).

[0008] Fig. 2 has illustrated one or multiple wireless devices (1), each configured with web-browser (8), can access the assigned storage volumes of storage system on a server system (3).

[0009] Fig. 3 has illustrated a scheme of present invention that how does a wireless device can download content file/data from ISP/ASP or other web sites to the assigned external storage of a wireless device. The external storage server configured with one or more storage devices such as RAID, IDE or SCSI or optical disk drives.

[00010] Fig. 4 has illustrated a scheme of present invention that how to support unlimited wireless devices to have larger size of external storage, which is an example of central controlled scalable distributed virtual server (CCDSVM). Each storage server and each wireless device have identical configuration as the server system (3) and wireless device (1) illustrated in Fig. 2. The control system has identical configuration as control management station (15) in Fig. 5.

[00011] Fig. 5 has illustrated a typical central controlled distributed scalable virtual machine ("CCDSVM").

[00012] Fig. 6 illustrates a typical computing system, which could be a server, laptop or desktop or handheld devices of PDA or cell phone etc. without limits. It is connected into a network of LAN or Intranet or Internet.

[00013] Fig. 7A has illustrated one embodiment that control station (15) of Fig. 5 provisions system units (3) of Fig. 5 and displays them in each user's web browser such that

user can selecting any system unit and submit a task for further to display major resources information on that system unit in CCDSVM; Fig. 7B has illustrated that the major system resource information of a system unit of Fig. 5 is displayed in user's web browser after said user mentioned in Fig. 7A had submitted requested task, where displayed resources information include system information such as system name, IP address, OS type and version, and processes/threads information; and various hardware information such as CPU, memory, storage, network information. Also each resource are displayed with associated attributes such as name, type, size, version number, and timestamps etc. without limits.

[00014] Fig. 7C, Fig. 7D, and Fig. 7F have illustrated that in one embodiment the status of each provisioned system unit (3) of Fig. 5 such as active or down or spare can be displayed in each user's web browser and can be monitored. Also, Fig. 7E has illustrated that the status of a system unit can be changed from active to spare through online operation via displayed operation menu and displayed list of system units.

[00015] Fig. 8A to Fig. 8 D, in one embodiment, has illustrated that the data including file and file-folder can be transferred (replicated) between any two systems in a virtual file server based on the CCDSVM. Fig. 8A has illustrated one embodiment that a list of systems in a virtual file server based on CCSVM has displayed in web browser (8) of each user along with operation options; therefore, user can select a source system (a system unit named ttsao6) and a destination system (MYADDR, which represents control station (15) also named ttsao5 in this figure) for data transfer;

[00016] Fig. 8B has illustrated another embodiment that a list of systems in CCSVM has displayed in web browser (8) of each user along with operation options such that user can select a source system (a system unit (3) named ttsao6) and a destination system (MYADDR, which is control station and also named ttsao5) for data transfer;

[00017] Fig. 8C has illustrated another embodiment that a list of systems in CCSVM has displayed in web browser (8) of each user along with operation options of "SEARCHDATA" such that user has actually find and selects a source system (a system unit named ttsao6.stt.com) and a destination system (ttsao5 that is the control station and also is named by MYADDR) for file transfer; in addition, one or more file systems along with resided one or more file-folders and files on each selected system are also displayed in web

browser; said operation options of "SEARCHDATA" option allows user to browser and walk through to search and select a desired file-folder or file for data transfer;

[00018] Fig. 8D has illustrated another embodiment that selected source and destination systems in CCSVM and selected source and destination file or file folder have being displayed in user's web browser along with a operating option of "XFERDATA"; therefore, said user is ready to transfer the desired data from source system to designated file-folder on designated targeted system just matter of hit submit button.

[00019] Fig. 9A to Fig. 9C has illustrated that how a virtual file system can be accessed by user from web browser (8) of Fig. 5; Fig. 9A illustrates that a list of systems in a virtual file server (3) based on CCDSVM and an operation button has been displayed in user's web browser; so that user is able to choose any system in the virtual file server to display each file system on system, where said system can be control station ("MYADDR", which is also named ttsao5) or one or more system units (ttsao4 and ttsao6);

[00020] Fig. 9B illustrates one embodiment that one or more file systems on a system unit (ttsao6) of virtual file serve have being displayed in user's web browser; Fig. 9C illustrates another embodiment that one or more file systems on control system (MYADDR, which is also named ttsao5) has being displayed in said user's web browser (8); in addition, the file systems in a selectable area and a submit button associated with operation for selecting file system are also displayed in user browser in both Fig. 9B and Fig. 9C.; each displayed file system includes associates attributes such as name of storage device volume name and mount point of each file system, the file system type, total number of blocks in this storage volume, the used blocks and remaining blocks of this storage device, and the percent of storage that has being used;

[00021] Fig. 9D illustrates one embodiment that one or more sub file-folders and files under a file-folder resides on a systems unit (ttsao6) has being displayed in user's web browser; also a list of options on operating menu and an associated submit button has being displayed in web browser, where displayed operating option include delete file (DELET), create new file-folder (MKDIR), copy file (COPY), move file (MOVE), rename file (RENAME); the displayed operating environment allow user to access and perform various task for file and file-folder on every system in virtual file server based on CCDSVM; each

displayed file and file-folder include its associated attributes such as file or file-folder's name, pathname, size, ownership, permission of read or write mode, timestamps, etc. without limits.

[00022] Fig. 10A to Fig. 10F illustrates a centralized storage management for system units in CCDSVM. The Fig. 10 A illustrates one embodiment that a list of system units in CCDSVM and an operation button has been displayed in user's web browser; so that user is able to choose any system unit in the CCDSVM to manage its storage devices;

[00023] Fig. 10B illustrates another embodiment that a specific system unit has been selected and displayed in user's web browser; The displayed information include the system unit's name, IP address, total number of disks, and total storage capacity; in addition, each storage device of system unit is displayed in a selectable area along with a associated submit button for operating purpose;

[00024] Fig. 10C illustrates another embodiment that one of storage devices on a system unit has being partitioned into one and more storage volumes and being displayed in user's web browser; the displayed information includes partitioned device volume name, size, starting logical block address, and ending logical block address (LBA); each displayed storage volume of a storage device can be used to make file system either on native storage system unit or by a remote system via IP based storage protocol; in addition, displayed information also includes a storage volumes selectable area, an storage operation selecting area, and an associated submit button for storage operation;

[00025] Fig. 10D illustrates one more embodiment that one of storage devices on a system unit has being partitioned into one and more storage volumes and being displayed in user's web browser; part of storage operation options are also displayed such as delete a storage volume ("DELPART"), change storage volume ("CHDSKPART") etc. without limits.

[00026] Fig. 10E and 10F illustrate an embodiment of a virtual storage volume pool of CCDSVM, which has been displayed in user's web browser; the displayed virtual storage volume pool includes each system unit's name, IP address, number of storage devices in the system unit, each partitioned storage volume and its storage volume name, size, starting logical block address (LBA) and ending logical block address;

[00027] Fig. 11A to Fig.11C illustrates one embodiment of user authentication scheme in CCDSVM environment; Fig. 11A illustrates one embodiment of a central authentication scenario, which has being displayed in a privileged user's web browser; the

displayed information includes a list of system in CCDSVM that can be assigned to each user for accessing, which could be control system or any system unit, a set of operating option for set up user authentication, the user name, password, and a specific IP address from that said user is permitted access CCDSVM;

[00028] Fig. 11B and 11C illustrate another embodiment of user authentication operation that has being displayed in user's web browser; the displayed information includes various operating option in addition to information displayed in Fig. 11A such as create user account profile (NEW), delete user account profile (DELENTRY), display user account profile (GETENTRY), and list one more user account profiles (LISTENTRY) etc. without limits;

[00029] In the drawing, like elements are designated by like reference numbers. Further, when a list of identical elements is present, only one element will be given the reference number.

Detailed Description Of The Invention

[00030] The following terms are used through out this patent application to describe the present invention. The internal storage media such as hard disk drives, memory sticks, memory etc is connected to a system directly through bus or a few inches of cable. Therefore, the internal storage media actually is a component of a system in a same enclosure. The external storage media is not a component of a system in a same enclosure. Therefore, they has to be connected through longer cable such as Ethernet cable for IP based storage, Fiber channel cable for fiber channel storage, or wireless media etc. The storage media of external storage could be magnetic hard disk drives, solid sate disk, optical storage drives, memory card, etc. and could be in any form such as Raid, which usually consisting a group of hard disk drives.

[00031] To effectively use the storage system, the storage usually needs to be partitioned into small volumes. After partition, each volumes can be used to establish a file systems on top of it. To simplify the discussion, the term of the storage volume, its corresponding file system, and the term of the partition of a storage may be used without differentiation in this invention.

[00032] Central controlled distributed scalable virtual machine system ("CCDSVM") allows a control management station to control group of systems and provide distributed services to client system in Internet, Intranet, and LAN environment.

[00033] The ISP stands for Internet service provider and the ASP stands for application service provider.

[00034] Fig. 1 has demonstrates the network connection between a wireless device and a server, where Net (2) represents a communication link, which may combined with wireless and non-wireless connection media and guarantee the communication packet can be sent/received between wireless device (1) and the server (3). It is also assume that the net (2) infrastructure is built up in such way that the user from web-browser of a wireless device can access and browse any web-site on the Internet, Intranet.

[00035] Console support software (5) on server (3) provides users on web-browser (8) of wireless device (1) with capability of running concurrent multi-tasks within a same single web-browser (8). Further, console support software (5) on server (3) provides user on the web-browser (8) of wireless device (1) to perform creating layered files/directory or folders structure, and to perform data management operations such as delete, move, copy, rename for data files or folders/directories and so forth on the assigned storage volume of server (3).

[00036] The other software modules (9) of wireless device (1) [[is]] <u>are</u> also capable to send data to or receive data from other service modules (7) of server (3) via communication link (2) through suitable IP or non-IP based protocol. The data file being sent cold be a digital photo picture, a message and so forth without limits. The console supporting software (5) of server (3) and the other software modules (9) of wireless device (1) can be implemented with any suitable languages such as C, C++, Java, and so forth without limits. The web-browser (8) of wireless device (1) can be any suitable software, which is capable to communication with web server software (4) on server (3) through HTTP protocol or other web based protocols.

[00037] Fig. 2 has demonstrated how does the storage of a server can be assigned to multiple wireless devices to use as their external storage. The storage system (10) of server (3) can be partitioned into multiple volumes (11) by administration staff through web-console (13) of web console host (12). The storage system (10) of server (3) can be partitioned in such way that each wireless devices can be assigned with a volume of desired size, which can

be best supported by the server for maximum number of wireless devices. Also, the storage connection media could be any kinds such as SCSI cable, IP cable, Fiber cable etc. The storage system itself could be various types and the storage system can be accessed through IP or non-IP based network and protocols.

[00038] Fig. 3 has demonstrated how a user from a web-browser (8) on wireless devices(1) can download data from a known web-site (12) to his/her assigned external storage (10) of server (3). The dash-lined path (a) represents a communication channel between wireless device (1) and any remote web-site (12), from where the contents can be downloaded. The dash-lined path (b) represents a communication channel between wireless devices (1) and the storage server (3). The dash-lined path (c) represents a communication channel between wireless devices (1) and the remote web-server (12), from where contents can be downloaded.

[00039] Using external storage system (10 of Fig. 2) of a server (3 of Fig. 2) by wireless devices (1 of Fig. 2) effectively resolves the storage limitation problem of wireless devices (1 of Fig. 2). In one embodiment, the entire storage (10 of Fig. 2) on a server (3 of Fig. 2) can be partitioned into suitable size of volumes (11 of Fig. 2) such as 4GB each to allow the server to serve maximum number of wireless devices (1 of Fig. 2). With the web console support software (5 of Fig. 2) of the server (3 of Fig. 2), the task of partitioning storage can be done through web-console (13 of Fig. 2) on console host (12 of Fig. 2) by administrative staff.

[00040] In order to support storage partition, first the console support software (5 of Fig. 2) of the server (3 of Fig. 2) must send storage information of the server (3 of Fig. 2) to the web-console (13 of Fig. 2) of console host (12 of Fig. 2), which includes the storage device name, storage total size etc. Second, the administration staff on console host (12 of Fig. 2) can use web-console (13 of Fig. 2) to fill and [[to]] send the storage partition information to the console support software (5 of Fig. 2) of the server (3 of Fig. 2) where the storage partition information includes the number of the partitions (volumes) and the size of each partition (volume). Third, upon receiving storage partition information from web-console (13 of Fig. 2) of console host (12 of Fig. 2), the console support software (5 of Fig. 2) of the server (3 of Fig. 2) performs the actual storage partition, which divides entire storage into multiple small volumes. Finally, for each small storage volume builds a corresponding file system.

[00041] Each storage volumes with its corresponding file system (11 of Fig. 2) of the storage (10 of Fig. 2) on server (3 of Fig. 2) needs to be exclusively assigned to a given

specific wireless device (1 of Fig. 2) by the console support software (5 of Fig. 2) on server (3 of Fig. 2).

[00042] It is necessary to provide wireless user to manage data and storage volume on assigned external storage volumes. With the support of console support software modules (5 of Fig 2) of the server system (3 of Fig. 2), the user on web-browser (8 of Fig. 2) of wireless device (1 of Fig. 2) can setup the folder/directory structure on the file system of his/her assigned external storage volume (11 of Fig. 2). In addition, the user on web-browser (8 of Fig. 2) of wireless device (1 of Fig. 2) can perform all data management operations such as delete, copy, move, rename etc. on that file system.

[00043] To support data management on external storage (10 of Fig. 2) from web-browser (8 of Fig. 2) of the wireless device (1 of Fig. 2), first the console support software modules (5 of Fig. 2) of the server system (3 of Fig. 2) must send data information of said a server system to web-browser (8 of Fig. 2) of wireless device (1 of Fig. 2). Therefore, the user from web-browser (8 of Fig. 2) of wireless device (1 of Fig. 2) can choose desired data management operations and send operation information to console support software modules (5 of Fig. 2) of the server system (3 of Fig. 2), where, the operations include establishing folder/directory, copying, moving, or reaming data file and so forth. Second, upon receiving the data management operation, the console support software modules (5 of Fig.2) of the server system (3 of Fig. 2) actually performs these operations on the assigned file system of assigned external storage volume (11 of Fig. 2) on the server system (3 of Fig. 2).

[00044] To store the received data such as digital photo pictures, or messages and so forth into the assigned file system on external storage (10 of Fig. 2) of a server (3 of Fig. 2), the software modules (9 of Fig. 2) of wireless device (1 of Fig. 2) send received data to service software modules (7 of Fig. 2) of server (3 of Fig. 2) via communication link. Upon receiving data, the service software modules (7 of Fig. 2) of server (3 of Fig. 2) write received data to assigned file system of the assigned storage volume (11 of Fig. 2) on server (3 of Fig. 2). The protocol used between these two communication entities could be either IP or non-IP based protocol.

[00045] If the wireless device (1 of Fig. 3) user want to download data from remote web server (12 of Fig. 3) directly into assigned file system (11 of Fig. 3) of the external storage (10 of Fig. 3) on server (3 of Fig. 3), the following steps are required:

[00046] 1) User from web-browser (8 of Fig. 3) of a specific wireless device (1 of Fig. 3) accesses a remote download web server site (12 of Fig. 3) and obtains the information for download via path (a) of Fig. 3. For example, to get information on a web-page of web server (12 of Fig. 3), which contains the data name for download.

[00047] 2) The other software modules (9 of Fig. 3) of a specific wireless device (1 of Fig. 3) obtains download information, which becomes available in the cached web-pages on wireless device (1 of Fig. 3) after the web-browser (8 of Fig. 3) accessing the download site (12 of Fig. 3).

[00048] 3) The other software modules (9 of Fig. 3) of a specific wireless device (1 of Fig. 3) send the obtained download information to service software modules (7 of Fig. 3) of storage server (3 of Fig. 3) via path (b) of Fig. 3.

[00049] 4) Upon receiving the download information from a specific wireless device (1), the service software module (7 of Fig. 3) of the storage server (3 of Fig. 3) sends a web download request to download web-site (12 of Fig. 3) via path (c) of Fig. 3 based on download information obtained and further receives the download data from web server of download web-site (12 of Fig. 3).

[00050] 5) Upon receiving downloaded data, the service software modules (7 of Fig. 3) of the storage server (3 of Fig. 3) write received data for the specific wireless device (1 of Fig. 3) into the assigned external file system (11 of Fig. 3) on the server (3 of Fig. 3).

[00051] There several ways to retrieve data from external storage of wireless device to wireless device itself. In one embodiment, a web-browser has embedded video or music functionality, the web-browser (8 of Fig.) of a wireless device (1 of Fig. 2) can be used to retrieve and play multimedia data file such as video or music stored in wireless device's external storage volume (10 of Fig.2), which actually located on a server (3 of Fig. 2). In another embodiment, the software module (9 of Fig. 2) of wireless device (1 of Fig. 2) can retrieve data file from assigned file system of the assigned storage volume (11 of Fig. 2) on server (3 of Fig. 2) via communication link.

[00052] It is possible to provide mass number of wireless device users with external storage. For example, to provide each user 2GB of storage space, then a 160GB disk drive can support 80 users. A 4096GB (4 Tera Bytes) storage system on a server unit can support 2024 user In order to support a large number of wireless devices with external storage, for example supporting 500,000 wireless devices, a larger number of servers are required, in this case 250 servers is required. In order to let a larger number of the server to effectively support larger number of the wireless devices, an infrastructure like CCDSVM is desirable. With CCDSVM the control management station can control larger number of storage servers to provide external storage for unlimited number of the wireless devices.

[00053] The Fig. 5 has illustrated an example of CCDSVM. The control station (15) provisions and controls each system unit (3) and distributing requests from one or more client systems (1) to available system unit (3) for required services. Further, in one embodiment, each system unit (3) can provide service to requested client (1) directly independent of other system units (3) without going through control system again.

[00054] In one embodiment of supporting larger number of wireless device to access external storage, each storage of each server system (3) will be pre-partitioned with one or more fix sized storage volumes. Once an owner of the wireless device sends a request, the control system (15) will identify an server system (3), which has storage space available to satisfy the requested wireless devices (1), and further assign and map available storage volume to requested wireless device (1).

[00055] In another embodiment, the control station (15) dynamically keeps and updates storage availability information in its information list of server systems (3), therefore, once receive a request of providing external storage volume, the control station (15) can assign the right size of storage immediately to requested wireless device. In addition, control station (15) can also instructing service software of server system (3) to dynamically partition storage volume on available storage space based on requested size, and further to assign partitioned storage volume to requested wireless device and keep mapping information on control system (15).

[00056] In addition, the server software of control station communicates to service software of system unit (3) to automatically provision one or more system unit (3) via a proprietary sequence of combined TCP/UDP/IP protocols, and it also keeps an information list of system units in both memory and secondary storage device on control system (15), which including each system unit's system name, ID, IP address, service pool ID, hardware resource information, and data resource and application service information. The system unit (3) can be automatically provisioned into one or more groups of services based on service type or ID. The server software of control system includes web server software modules (4), console support software modules (5), which further includes web server interface software modules (6) and control management software modules (7).

[00057] In present invention, the system unit (3) of Fig. 5 has identical role and similar features as the server system (3) in Fig. 1 and Fig. 2 and the storage server in Fig. 4. Also, the server software of control system provide each user from each of their own single web browser or non web-based UI with capability of performing one or more concurrent tasks within said a single web browser (8) or non web based UI over said CCDSVM.

[00058] The server software of control system will receive each task information and store each task information into a corresponding valid entry of user space task list along with acquiring one or more locks for executing said task. Upon said task is finished, server software of control station will release corresponding entry of user space task list and locks. In addition, server software of control station (15) will obtain the status or result of each task or a location of task result and provide response encoded with status or result or the location information of result back to corresponding web browser or said non web based UI. Said response can be made independently regardless said task is finished or not. In present invention, the client system (1) of Fig. 5 has identical role and similar features as the wireless device (1) in Fig. 1, 2, 3, and 4.

[00059] These management tasks can be performed from web browser (8) include storage configuration, storage volume allocation and assignment, storage partitioning and repartitioning for RAID or SCSI or IDE disk drives, make and mount file system on the top of storage volume; monitoring status of storage, network, CPU, memory, processes/threads and other resource's usage and activity. Move or transmit data such as a multiple gigabytes of file or other data in any form from any point or any system to another point or system within said

pools; setup authentication of specific user from a specific web-console with certain privilege for entire CCDSVM or for a specific system, which could be any storage server or host or control station; setting up the authentication for specific services on one or more specific hosts, or on control system, and stores the authentication information in a list on control system; create file system, file and file-folder or directory structures, and perform all other related data file operations on either the controls station or hosts for data or application file accessing; and all other kind of tasks and operations, which can be run in command line user interactive work (operating) environment or native window based user interactive work environment. The mentioned data file can be documentation file such as text or Word or PDF or spreadsheet file or presentation slide file etc. and can be various record file. The mentioned application file can be various formatted binary file to provide application service such as web service, message service network service, storage service etc without limits.

[00060] FIG. 6 illustrates a typical computer system (16), in one embodiment, the distribution control station (15) comprises a computer system (16) which includes a bus (102) or other communication mechanism for communicating information, and a processor (CPU) (104) coupled with the bus (102) for processing information. The computer system (16) also includes a main memory (106), such as a random access memory (RAM) or other dynamic storage device, coupled to the bus (102) for storing information and program instructions to be executed by the processor (104). The main memory (106) also may be used for storing temporary variables or other intermediate information during execution or instructions to be executed by the processor (104). The computer system (16) further includes a read only memory (ROM) (108) or other static storage device coupled to the bus (102) for storing static information and instructions for the processor (104). a storage device (110), such as a magnetic disk or optical disk, is provided and coupled to the bus (102) for storing information and instructions. The bus (102) may contain, for example, thirty-two address lines for addressing video memory or main memory (106). The bus (102) can also include, for example, a 32-bit data bus for transferring data between and among the components, such as the CPU 104, main memory 106, video memory and the storage media (110). Alternatively, multiplex data / address lines may be used instead of separate data and address lines.

[00061] In one embodiment, the CPU (104) comprises a microprocessor manufactured by Motorola(R), such as the 680x0 processor or a microprocessor manufactured by Intel(R), such as the 80X86, or Pentium(R) processor, or a SPARC(R) microprocessor from Sun Microsystems(R). However, any other suitable microprocessor or microcomputer may be utilized. The main memory (106) can comprise dynamic random access memory (DRAM). And video memory (not shown) can comprise a dual-ported video random access memory.

[00062] The computer system (16) may be coupled via the bus (102) to a display (112), such as a cathode ray tube (CRT), liquid crystal display (LCD) or Plasma display panel, for displaying information to a computer user. An input device (114), including alphanumeric and other keys, is coupled to the bus (102) for communicating information and command selections to the processor (104). Another type of user input device comprises cursor control (116), such as a mousse, a trackball, or cursor direction keys for communicating direction information and command selections to the processor 104 and for controlling cursor movement on the display (112). This input device typically has two degrees of freedom in two axes, a first axis (e.g., x) and a second axis (e.g., y) that allows the device to specify positions in a plane.

[00063] According to one embodiment of the invention, the steps of the processes of the present invention is provided by computer systems (16) in response to the processor (104) executing one or more sequences of one or more instructions contained in the main memory (106). Such instructions may be read into the main memory (106) from another computer-readable medium, such as the storage device (110). Execution of the sequences of instructions contained in the main memory (106) causes the processor (104) to perform the process steps described herein. One or more processors in a multi-processing arrangement may also be employed to execute the sequences of instructions contained in the main memory (106). In alternative embodiments, hard-wired circuitry such as Application Specific Integrated Circuit (ASIC) may be used in place of or in combination with software instructions to implement the invention. Thus, embodiments of the invention are not limited to any specific combination of hardware circuitry and software.

[00064] The term "computer-readable medium" as used herein refers to any medium that participated in providing instructions to the processor 104 for execution. Such a medium may take may forms, including but not limited to, non-volatile media, volatile media, and

transmission media. Non-volatile media includes, for example, optical or magnetic disks, such as the storage device (110). Volatile media includes dynamic memory, such as the main memory (106). Transmission media includes coaxial cables, copper wire and fiber optics, including the wires that comprise the bus (102). Transmission media can also take the form of acoustic or light waves, such as those generated during radio wave and infrared data communications.

[00065] Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, or any other magnetic medium, a CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, an EPROM, a FLASH-EPROM, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read.

[00066] Various forms of computer readable media may be involved in carrying one or more sequences of one or more instructions to the processor (104) for execution. For example, the instructions may initially be carried on a magnetic disk of a remote computer. The remote computer can load the instructions into its dynamic memory and send the instructions over a telephone line using a modem. A modem local to the computer system (16) can receive the data on the telephone line and use an infrared transmitter to convert the data to an infrared signal. An infrared detector coupled to the bus (102) can receive the data carried in the infrared signal and place the data on the bus (102). The bus (102) carries the data to the main memory (106), from which the processor (104) retrieves and executes the instructions. The instructions received from the main memory (106) may optionally be stored on the storage device (110) either before or after execution by the processor (104).

[00067] The computer system (16) also includes a communication interface (118) coupled to bus the (102). The communication interface (118) provides a two-way data communication coupling to a network link (120) of the network infrastructure (2) that is connected to routers in network infrastructure (2). For example, the communication interface (118) may be an integrated services digital network (ISDN) card or a modern to provide a data communication connection to a corresponding type of telephone line, which can comprise part of the network link (120). As another example, the communication interface (118) may be a local area network (LAN) card to provide a data communication connection to

a compatible LAN. Wireless links may also be implemented. In any such implementation, the communication interface (118) sends and receives electrical electromagnetic or optical signals that carry digital data streams representing various types of information.

[00068] The network link (120) typically provides data communication through one or more networks to other data devices. For example, the network link (120) of network infrastructure (2) may provide a connection through a local network to a host/server computer or to data equipment operated by an Internet Service Provider (ISP) (126) via switched of network infrastructure (2). The ISP (126) in turn provides data communication services through the world wide packet data communication network now commonly referred to as the "Internet" (128) of network infrastructure (2). The Internet (128) uses electrical electromagnetic or optical signals that carry digital data streams. The computer system (16) further includes web server (4) for providing e.g. a user interface to the clients (1) or console hosts (12) for requesting data streams from the virtual server . In one example said user interface can include a list of available video content files in the virtual video server or virtual file server and ways of selecting content files for viewing, including optionally payment terms.

[00069] The computer system (16) can send messages and receive data, including program code, through the communication interface (118). In the Internet example, clients (1) can transmit code (e.g., program instructions, HTML, etc.) for an application program through the Internet (128), the ISP (126), and communication interface (118).

[00070] The computer system (16)'s hardware capacity determine such how many concurrent tasks, how may total users, how many concurrent users it can support. The network hardware such as the bandwidth of each network interface (118) and the total number of network interface cards, the speed of CPU, and the size of memory (106) determine the total number of concurrent data connections with certain rate of per connection the computer system (16) can provide, and determine the total number of concurrent users and tasks can have or run on computer system (16), and determine the total number of other systems that computer system (160 can control.

[00071] The example versions of the invention described herein can be implemented as logical operations in a distribution control station (15). The logical operations of the present

invention can be implemented as a sequence of steps executing on distribution control station (15). The implementation is a matter of choice and can depend on performance of the distribution control station (15) implementing the invention. As such, the logical operations constituting said example versions of the invention are referred to for e.g. as operations, steps or modules.

[00072] The present invention has been described in considerable details with reference to certain examples. However, other versions and examples are also possible, therefore, the spirit of this invention shall not be limited to these examples and/or embodiments.